

Federal Funds for Research and Development

Fiscal Years 1995, 1996, and 1997

Volume 45

Detailed Statistical Tables

Division of Science Resources Studies
Directorate for Social, Behavioral and Economic Sciences

National Science Foundation



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OVERVIEW

INTRODUCTION

Federal agencies expected their funding for research and development (R&D) and R&D plant to decrease 1 percent (4-percent decrease in inflation-adjusted 1992 dollars) to \$70 billion in fiscal year (FY) 1997, according to survey reports received during the period May through August 1996. Development accounts for the entire R&D decrease, declining by 4 percent (a 6-percent decrease in constant 1992 dollars) from estimated FY 1996 levels (to \$39 billion). Research spending (including basic and applied research) will increase 2 percent (to \$29 billion). But after adjusting for inflation, Federal obligations for research will decline slightly by 0.4 percent. Research would account for 42 percent of the FY 1997 R&D money. Also, R&D plant will increase 6 percent (a 3-percent increase in constant 1992 dollars) to \$2 billion. The estimated obligations provided in this report are subject to change as Federal agencies' budgets are updated to reflect approved programs.

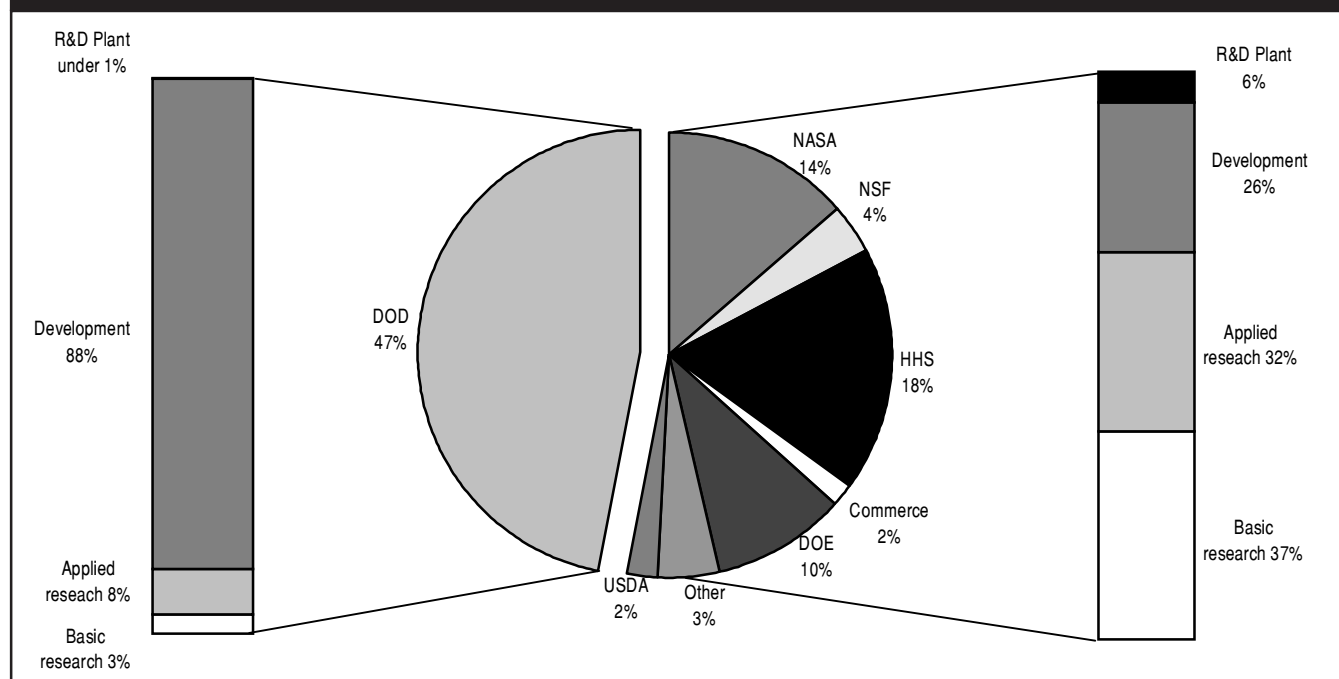
AGENCY TOTAL FUNDING SHARES

Seven Federal agencies, out of the 33 that report to the R&D survey, account for 97 percent (\$67 billion) of total projected Federal funding for R&D and R&D

plant in FY 1997 (Chart 1). The Department of Defense (DOD) will still comprise the largest share (47 percent), even though its funding will decrease 4 percent from FYs 1996-97. Contributing to DOD's drop in overall R&D funding are Navy (14 percent decrease), combined Defense agencies (12 percent decrease), and the Army (its military functions component) (10-percent decrease). Within the Defense agencies, the Washington Headquarters Services (WHS) (down 23 percent), Special Operations Command (down 20 percent), and Ballistic Missile Defense Organization (BMDO) (down 13 percent) report the largest percentage decreases in proposed R&D funding.

Funding from the Department of Health and Human Services (HHS) will comprise the second largest share of Federal agencies' R&D funding (18 percent), increasing by 3 percent from the FY 1996 level. Most (94 percent) of the HHS amount is from its National Institutes of Health (NIH) for support of the life sciences. The other top funding agencies are the National Aeronautics and Space Administration (NASA) (14 percent of the FY 1997 Federal R&D and R&D plant total), the Department of Energy (DOE) (10 percent), the National Science Foundation (NSF) (4

Chart 1. Projected Federal obligations, by agency and character of work: 1997



SOURCE: NSF/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1995, 1996, and 1997.

percent), the Department of Agriculture (USDA) (2 percent), and the Department of Commerce (DOC) (nearly 2 percent). Almost all (99 percent) of DOC's funding is from its National Institute of Standards and Technology (NIST) and National Oceanic and Atmospheric Administration (NOAA). NASA, DOC, and USDA each project that combined R&D and R&D plant funding will decline in FY 1997, whereas such funding from DOE and NSF is slated to increase.

R&D GROWTH IN THE 1990s

Of the seven major R&D funding agencies, DOC reports the largest estimated R&D and R&D plant funding annual growth rate for the FYs 1990-97 period (15 percent, 12 percent in constant 1992 dollars)

(Table 1). DOC's growth reflects the rapid increases in funding at NIST. Even though reporting a projected 9-percent decrease in overall R&D funding in FY 1997, NIST increased its obligations from \$131 million (\$141 million in constant dollars) in FY 1990 to \$647 million (\$573 million in constant dollars) in FY 1997. However, the FY 1997 NIST R&D funding level is nearly back to what it was in FY 1995. HHS follows DOC with a 6-percent growth rate (3 percent in constant dollars during the same period). NSF expects its R&D and R&D plant funding to average 5-percent growth per year (2 percent in constant dollars) from FYs 1990-97. DOD's obligations will drop on average 2 percent annually. In constant dollars, its funding will decrease at an estimated annualized rate of 5 percent over this seven-year period.

Table 1. Federal Obligations for R&D and R&D Plant: Fiscal Years 1990-97

Agency	FY 1990 Actual	FY 1991 Actual	FY 1992 Actual	FY 1993 Actual	FY 1994 Actual	FY 1995 Actual	FY 1996 Preliminary	FY 1997 Preliminary	Average Percentage Change FYs 1990-97
(in millions of current dollars)									
Total.....	65,831	64,148	68,577	70,415	69,427	71,012	71,048	70,149	0.9
DOD.....	37,756	32,561	36,526	36,221	34,788	34,427	34,369	33,004	-1.9
HHS.....	8,513	9,842	9,085	10,499	11,142	11,711	12,218	12,614	5.8
NASA.....	7,060	8,004	8,475	8,769	8,812	9,640	9,946	9,519	4.4
DOE.....	6,547	7,203	7,493	7,724	6,960	6,890	6,432	6,721	0.4
NSF.....	1,729	1,945	1,970	2,012	2,212	2,439	2,361	2,479	5.3
USDA.....	1,211	1,381	1,492	1,470	1,525	1,523	1,502	1,494	3.1
DOC.....	454	505	672	682	857	1,214	1,252	1,201	14.9
Other.....	2,562	2,707	2,864	3,038	3,131	3,168	2,968	3,117	2.8
(in millions of constant 1992 dollars)									
Total.....	70,634	65,996	68,577	68,630	66,121	65,996	64,530	62,134	-1.8
DOD.....	40,510	33,498	36,526	35,303	33,131	31,995	31,216	29,233	-4.6
HHS.....	9,135	10,126	9,085	10,232	10,611	10,884	11,097	11,173	2.9
NASA.....	7,575	8,234	8,475	8,547	8,392	8,959	9,034	8,431	1.5
DOE.....	7,024	7,411	7,493	7,528	6,629	6,403	5,842	5,953	-2.3
NSF.....	1,855	2,001	1,970	1,961	2,107	2,267	2,144	2,196	2.4
USDA.....	1,299	1,421	1,492	1,433	1,452	1,415	1,364	1,323	0.3
DOC.....	487	520	672	664	816	1,128	1,137	1,064	11.8
Other.....	2,749	2,785	2,864	2,961	2,982	2,944	2,696	2,761	0.1

SOURCE: National Science Foundation/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1995, 1996, and 1997.

DEVELOPMENT FUNDING

As in the past, the Federal Government obligates the largest portion of its R&D dollars for development, which accounts for approximately 55 percent of the FY 1997 preliminary total R&D and R&D plant obligations. However, the development share has been decreasing throughout the 1990's, having declined from its peak 64-percent share in FY 1990 (Chart 2). Agencies project development funds to drop 4 percent (down 6 percent in constant 1992 dollars) from their FY 1996 level, to \$39 billion (\$34 billion in constant 1992 dollars) in FY 1997.

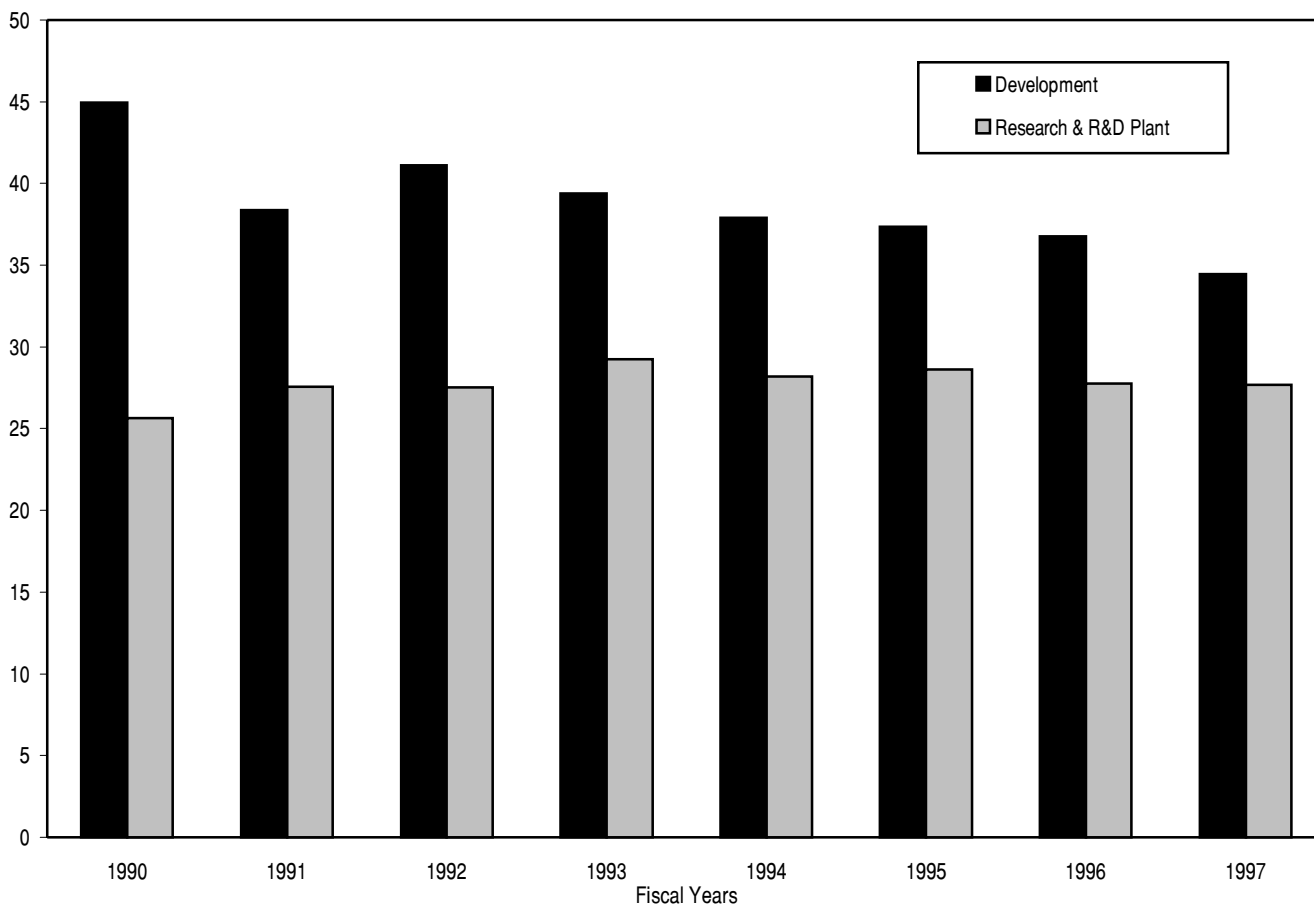
Six agencies account for 99 percent of estimated Federal development obligations in FY 1997 (Table 2). These agencies are DOD (more than three-fourths from the three service agencies—Army, Navy, and Air Force), NASA, DOE, HHS (almost entirely from NIH),

Department of Transportation (DOT) (more than 90 percent from the Federal Aviation Administration and Federal Highway Administration), and DOC (more than three-fourths from NIST). However, after adjusting for inflation, all six of these agencies report an expected decrease in development funding for FY 1997: DOC (down 19 percent), NASA (down 9 percent), DOD (down 6 percent), DOE (down 5 percent), DOT (down 1 percent), and HHS (down under 1 percent).

To better understand the component pieces of Federal R&D funding and to allow a closer look at the funding activity of DOD agencies that report to the Federal Funds Survey, NSF collects data on DOD development dollars in two categories: advanced technology development and major systems development. Advanced technology includes development for military and nondefense applications. Major systems

Chart 2. Federal Obligations for R&D and R&D Plant: Fiscal Years 1990-97

Billions of 1992 constant dollars



SOURCE: NSF/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1995, 1996, and 1997

Table 2. Federal Obligations for Development: Fiscal Years 1990-97

Agency	FY 1990 Actual	FY 1991 Actual	FY 1992 Actual	FY 1993 Actual	FY 1994 Actual	FY 1995 Actual	FY 1996 Preliminary	FY 1997 Preliminary	Average annual percent change, FY 1990-97
(millions of current dollars)									
Total.....	41,937	37,327	41,102	40,424	39,815	40,181	40,499	38,890	-1.1
DOD.....	33,739	28,417	32,056	31,066	30,304	30,028	30,336	29,103	-2.1
NASA.....	3,473	3,909	4,428	4,471	4,456	4,969	5,332	4,964	5.2
DOE.....	3,060	2,709	2,760	2,822	2,766	2,685	2,376	2,320	-3.9
HHS.....	939	1,594	1,042	1,157	1,285	1,379	1,390	1,417	6.1
DOT.....	247	265	288	319	347	356	307	311	3.3
DOC.....	61	40	55	74	108	244	275	227	20.6
USDA.....	47	61	66	76	77	80	150	82	8.3
Other.....	371	331	406	439	473	440	334	466	3.3
(millions of constant 1992 dollars)									
Total.....	44,997	38,402	41,102	39,399	37,919	37,343	36,784	34,447	-3.7
DOD.....	36,201	29,235	32,056	30,278	28,861	27,907	27,553	25,778	-4.7
NASA.....	3,726	4,022	4,428	4,358	4,244	4,618	4,843	4,396	2.4
DOE.....	3,283	2,788	2,760	2,750	2,634	2,495	2,158	2,055	-6.5
HHS.....	1,007	1,639	1,042	1,127	1,224	1,282	1,262	1,255	3.2
DOT.....	265	273	288	311	331	331	279	276	0.5
DOC.....	66	41	55	72	103	226	249	201	17.4
USDA.....	51	63	66	74	74	75	136	73	5.4
Other.....	398	341	406	428	450	409	303	413	0.5

SOURCE: NSF/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1995, 1996, and 1997

include testing and evaluation of mostly defense-related systems. This *Federal Funds* volume is the second to include such statistics on development funding.

DOD expects to provide \$25 billion (86 percent of its total development obligations) toward major systems development, which represents a projected 2-percent drop in FY 1997 (down 4 percent in constant 1992 dollars) (Table 3). Combined, the Air Force, Navy, Army (its Military Functions component), and BMDO expect to account for \$23 billion (94 percent) of the estimated major systems development obligations. However, three of these four funders expect decreases in major systems development from FYs 1996-97—Army and Navy expect to decline by 5.5 percent and 15 percent, respectively, and BMDO is slated to drop by 11 percent. Air Force will increase its

funding more than \$1 billion (12 percent), three times the increase from FYs 1995-96.

DOD projects that advanced technology development funding will decrease \$0.7 billion (15 percent to \$4 billion) in FY 1997. Six DOD agencies account for nearly all (97 percent) of the estimated advanced technology development funding. They are the Defense Advanced Research Projects Agency (DARPA) (\$1 billion for advanced technology development), WHS (\$0.7 billion), BMDO (\$0.6 billion), and the three service agencies, each with \$0.5 billion. However, each of these agencies reports an expected decrease in funding for advanced technology development from FYs 1996-97—Army down by \$300 million, WHS down by \$181 million, BMDO down by \$125 million, and DARPA down by \$103 million.

Table 3. Federal Obligations for Development by Agencies in DOD: Fiscal Years 1994-97

(millions of current dollars)

	FY 1994 Actual	FY 1995 Actual	FY 1996 Preliminary	FY 1997 Preliminary	Percentage Change FYs 1996-97
Total DOD.....					
Basic Research.....	1,222	1,264	1,134	1,146	1.0
Applied Research.....	3,040	3,070	2,814	2,716	-3.5
Development 1/.....	30,304	30,028	30,336	29,103	-4.1
Advanced Tech.....	4,461	4,578	4,829	4,101	-15.1
Major Systems.....	25,812	25,450	25,507	25,002	-2.0
Army.....					
Development.....	4,721	4,567	4,184	3,701	-11.5
Advanced Tech.....	1,187	641	764	470	-38.4
Major Systems.....	3,514	3,926	3,421	3,231	-5.5
Navy.....					
Development.....	8,082	8,083	7,863	6,728	-14.4
Advanced Tech.....	412	414	484	449	-7.2
Major Systems.....	7,670	7,669	7,379	6,279	-14.9
Air Force.....					
Development.....	11,713	10,963	11,214	12,487	11.4
Advanced Tech.....	448	566	501	487	-2.8
Major Systems.....	11,265	10,398	10,713	12,000	12.0
Total Defense Agencies.....					
Development.....	5,544	6,161	6,824	5,913	-13.3
Advanced Tech.....	2,414	2,958	3,080	2,695	-12.5
Major Systems.....	3,120	3,204	3,744	3,218	-14.0

1/ DOD development does not equal the sum of the advanced technology and major systems detail because some DOD agencies could not break down development into these two categories.

SOURCE: NSF/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1995, 1996, and 1997

BASIC RESEARCH FUNDING

Basic research support will reach almost \$15 billion dollars, according to the preliminary FY 1997 estimates. By comparison, Federal agencies report applied research funding will total just slightly more than \$14 billion. In constant 1992 dollars, basic research will decrease nearly 1 percent, and applied research will remain flat.

The basic research share of Federal R&D obligations has increased slowly since FY 1992. In FY 1992, basic research comprised 18 percent of the total R&D. That percentage increased slightly each year and reaches 21 percent in FY 1997, according to preliminary estimates. Overall, Federal agencies report a 4-

percent average annual rate of growth (1 percent in constant 1992 dollars) from FYs 1990-97. When adjusted for inflation, basic research funding has held steady at about \$13 billion since FY 1993.

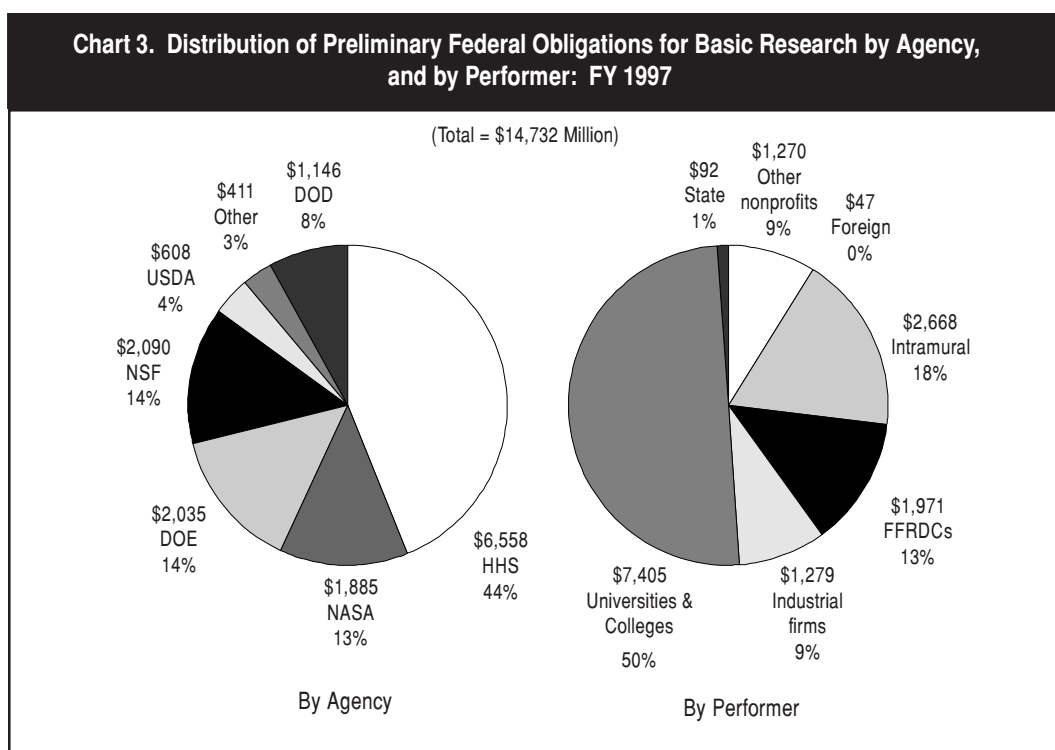
Six agencies provide 97 percent of the estimated Federal basic research total in FY 1997 (Chart 3). They are HHS (almost entirely from NIH), NSF, DOE, NASA, DOD, and USDA. Of these six agencies, only NASA reports an expected decrease in basic research funding for FY 1997, dropping 6 percent (down \$124 million). Each of the other five agencies expects strong to modest increases in basic research funding: NSF (6 percent); DOE (4 percent); USDA (4 percent); HHS (2 percent); and the DOD (1 percent).

After adjusting for inflation, HHS expects its obligations for basic research to average 2-percent annual growth from FYs 1990-97. DOE would increase basic research funding second fastest, with just under 2-percent real-dollar growth during the same time period. NSF reports a basic research funding growth rate of 1 percent, and DOD reveals a flat rate. In real dollars, USDA and NASA expect slightly less funding for basic research in FY 1997 than was available in FY 1990.

PERFORMERS OF BASIC RESEARCH

Universities and colleges, receiving 50 percent of the Federal basic research funds in FY 1997, might expect a 4.5-percent decrease in such obligations to \$7.4 billion in that year (Chart 3). Intramural performers of basic research, which covers Federal in-house performance and costs associated with the planning and administration of both internal and external basic research programs by Federal personnel, are slated to receive 18 percent of all Federal basic research funds. This represents a 10.5-percent increase over FY 1996 funding, reversing the 11-percent drop from FYs 1995-

96. The largest Federal intramural basic research performers in FY 1997 include HHS, \$1.1 billion (nearly all performed by NIH); NASA, \$0.5 billion; USDA, \$0.4 billion (91 percent from the Agricultural Research Service), and DOD, \$0.3 billion (mostly from the three service agencies: Army, Navy, and Air Force) (Table 4). Federally Funded Research and Development Centers (such as Jet Propulsion Laboratory, Sandia National Laboratories, and Lincoln Laboratory) will receive 13 percent of the total basic research funds, or \$2 billion. Industrial firms can expect to receive 9 percent of the basic research, an increase of 4 percent over the FY 1996 funding level. Non-academic nonprofit organizations might expect to receive nearly 9 percent of the basic research funds, increasing more than \$0.2 billion (an increase of nearly 20 percent) over the FY 1996 funding level. State and local governments, which as a group will receive less than one percent of all Federal basic research funds, and foreign performers which will receive under a half percent of basic research funds, are projected to receive large percentage increases for FY 1997, 31 percent and 13 percent, respectively.



SOURCE: NSF/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1995, 1996, and 1997

Table 4. Preliminary Federal Obligations for Basic Research, by Agency and Performer: Fiscal Year 1997

(in millions of current dollars)

Agency	Total	Intramural	Industrial Firms	All FFRDCs	Univ. & Colleges	Other Nonprofits	State & Local Governments	Foreign
Total.....	14,732	2,668	1,279	1,971	7,405	1,270	92	47
DOD.....	1,146	293	153	5	647	39	0	9
HHS.....	6,558	1,142	270	154	3,928	973	64	27
NASA.....	1,885	471	614	258	480	56	1	3
DOE.....	2,035	69	103	1,407	440	14	2	1
NSF.....	2,090	18	90	146	1,680	149	3	4
USDA.....	608	395	7	0	199	4	1	2
Other.....	411	280	41	0	31	35	23	1

SOURCE: NSF/SRS, Survey of Federal Funds for Research and Development: Fiscal Years 1995, 1996, and 1997

GENERAL NOTES

Data in the tables of this publication were derived from the Survey of Federal Funds for Research and Development, Volume 45, for fiscal years 1995–97. They reflect research and development (R&D) funding levels as reported by 33 Federal agencies in May through August 1996. All agencies that conduct R&D programs were surveyed.

R&D totals in these tables are given in both outlays and obligations. The R&D obligation data are further categorized according to character of work (basic research, applied research, and development), performer, field of science or engineering (for research but not for development), and Federal R&D funding by State. Obligations for research performance at universities and colleges by fields of science or engineering are also shown, as are R&D plant data.

The amounts reported for each year are expressed in obligations or outlays incurred, or expected to be incurred, in that year, regardless of when the funds may have been authorized, appropriated, or received by an agency, and regardless of whether the funds are identified in an agency's budget specifically for research, development, or R&D plant.

Data for 1995 are actual, representing completed transactions. Data for 1996 and 1997 are estimated because they do not represent final actions. The Survey of Federal Funds for Research and Development was conducted during the third quarter of fiscal year 1996. The amounts reported for 1996 reflect congressional appropriation actions as of that period, as

well as apportionment and reprogramming decisions as of that time. Data for 1997 represent administration budget proposals that had not been acted on. Authorization, appropriation, deferral, and apportionment actions that were completed after these data were collected will be reflected in later surveys of this series.

Accuracy of the data depends in part on the judgment of the respondent. Since many agency R&D programs are not identified as budget-line items, agency officials must identify R&D and R&D plant activities within broader programs. Over the years personnel of the participating agencies have developed increasing skill and consistency in meeting the survey requirements, and their interaction with the National Science Foundation staff has considerably increased the reliability of the data.

Inquiries relating to *Federal Funds for Research and Development: Fiscal Years 1995, 1996, and 1997*, Volume 45, should be directed to—

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Note

For trend comparison, use only the historical data for fiscal years 1976–97 contained in tables C-89 through C-109a in this Federal funds, Volume 45 series. These tables incorporate changes in prior-year data made by the agencies to reflect program reclassifications. Do not use data published earlier.

SECTION A.

TECHNICAL NOTES

SCOPE AND METHOD

During the period May through August 1996, a total of 33 Federal agencies and their subdivisions—98 individual respondents—submitted data in response to the National Science Foundation's (NSF's) annual Survey of Federal Funds for Research and Development (Federal funds survey), Volume 45, which was distributed in February 1996. The agencies reported their data as obligations and outlays incurred, or expected to be incurred, regardless of when the funds were appropriated or whether they were identified in the respondents' budgets specifically for research and development (R&D) activities.

Only those agencies that had obligations in the variables represented by a particular table appear in that table. For a complete list of the Federal agencies that have been included in the Federal funds survey, refer to appendix A.

DEFINITIONS

The definitions are essentially unchanged from those used in past Federal funds surveys.

1. An **agency** is an organization of the Federal Government whose principal executive officer reports to the President. The Library of Congress is also included in the survey, even though its chief officer reports to Congress. **Subdivision** refers to any organizational unit of a reporting agency, such as a bureau, division, office, or service.
2. **Obligations** and **outlays** reported are consistent with figures shown for fiscal years 1995, 1996, and 1997 appearing in *The Budget of the United States Government, Fiscal Year 1997*. The R&D data in both agency submissions were based on the same definitions and are reconcilable.

Obligations represent the amounts for orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated and when future payment of money is required.

Outlays represent the amounts for checks issued and cash payments made during a given

period, regardless of when the funds were appropriated.

Obligations and outlays cover all transactions that occurred in fiscal year 1995 and those estimated for fiscal years 1996 and 1997.

The data include all Federal funds available to an agency that the agency received or expects to receive from direct appropriations, trust funds, special account receipts, corporate income, or other sources, including funds appropriated to the President.

The amounts shown for each year reflect obligations or outlays for that year regardless of when the funds were originally authorized or received and regardless of whether or not they were appropriated, received, or identified in the agency's budget specifically for research, development, or R&D plant.

In reporting its obligations or outlays, **each agency includes the amounts transferred to other agencies for support of research and development. The receiving agencies do not report funds transferred to them.** Similarly, a subdivision of an agency that transfers funds to another subdivision within that agency reports such obligations or outlays as its own.

Obligations and outlays for R&D performed for an agency in foreign countries include all funds available to the agency for this purpose, including funds separately appropriated for special foreign currency programs.

Funds reported for research and development reflect full cost coverage. In addition to costs of specific R&D projects, the applicable overhead costs are also included. The amounts reported include the costs of planning and administering R&D programs, laboratory overhead, pay of military personnel, and departmental administration.

3. The **fiscal year** in the Federal Government accounting period begins October 1 of a given year and ends September 30 of the following year; thus, fiscal year 1995 began on October 1, 1994, and ended September 30, 1995.

4. **Research, development, and R&D plant** include all direct, incidental, or related costs resulting from, or necessary to, performance of R&D and costs of R&D plant, defined as follows, regardless of whether the R&D is performed by a Federal agency (intramurally) or by private individuals and organizations under grant or contract (extramurally). R&D excludes routine product testing, quality control, mapping and surveys, collection of general purpose statistics, experimental production, and the training of scientific personnel.

- a. **Research** is systematic study directed toward fuller scientific knowledge or understanding of the subject studied. Research is classified as either basic or applied according to the objectives of the sponsoring agency.

In **basic research** the objective of the sponsoring agency is to gain more complete knowledge or understanding of the fundamental aspects of phenomena and of observable facts, without specific applications toward processes or products in mind.

In **applied research** the objective of the sponsoring agency is to gain knowledge or understanding necessary for determining the means by which a recognized need may be met.

- b. **Development** is systematic use of the knowledge or understanding gained from research, directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes. It excludes quality control, routine product testing, and production.

To better differentiate between that part of the Federal R&D budget, which supports “science and key enabling technologies” (including for military and nondefense applications) and that which primarily concerns “testing and evaluation” (of mostly defense-related systems), NSF now

collects from DoD development dollars in two categories, advanced technology development and major systems development.

Within DoD’s research categories, advanced technology development is classified as 6.3A. Major systems development is classified as 6.3B through 6.7 and includes demonstration and validation, engineering and manufacturing development, management and support, and operational system development.

- c. **Demonstration activities** that are part of R&D (i.e., that are intended to prove or to test whether a technology or method does in fact work) are included. Demonstrations intended primarily to make information available about new technologies or methods are excluded.

- d. **R&D plant** (R&D facilities and fixed equipment, such as reactors, wind tunnels, and particle accelerators) includes acquisition of, construction of, major repairs to, or alterations in structures, works, equipment, facilities, or land for use in R&D activities at Federal or non-Federal installations. Excluded from the R&D plant category are expendable or movable equipment (e.g., spectrometers, microscopes) and office furniture and equipment. Also excluded are the costs of predesign studies (e.g., those undertaken before commitment to a specific facility). These excluded costs are reported under “total conduct of research and development.” Obligations for foreign R&D plant are limited to Federal funds for facilities that are located abroad and used in support of foreign research and development.

5. **Fields of science and engineering** in this survey consist of eight broad field categories, each consisting of a number of detailed fields. The broad fields are life sciences; psychology; physical sciences; environmental sciences; mathematics and computer sciences; engineering; social sciences; and other sciences, not elsewhere classified. The term “not elsewhere

classified” (n.e.c.) is used for multidisciplinary projects within a broad field and for single-discipline projects for which a separate field has not been assigned. The following list presents the detailed fields grouped under each of the broad fields, together with illustrative disciplines of detailed fields.

The illustrative disciplines are intended to be guidelines, not sharp definitions; they represent examples of disciplines generally classified under each detailed field. A discipline under one detailed field may be classified under another detailed field when the major emphasis is elsewhere. Research in biochemistry, for example, might be reported as biological, agricultural, or medical, depending on the orientation of the project. Human biochemistry would be classified under biological, but animal biochemistry or plant biochemistry would fall under agricultural. In no case is the research reported under more than one field. No double-counting is intended or allowed.

- a. **Life sciences** consist of five detailed fields: biological (excluding environmental); environmental biology; agricultural; medical; and life sciences, n.e.c. Examples of the disciplines under each of these fields are as follows:

Biological (excluding environmental): anatomy; biochemistry; biology; biometry and biostatistics; biophysics; botany; cell biology; entomology and parasitology; genetics; microbiology; neuroscience (biological); nutrition; physiology; zoology; other biological, n.e.c.

Environmental biology: ecosystem sciences; evolutionary biology; limnology; physiological ecology; population and biotic community ecology; population biology; systematics; other environmental biology, n.e.c.

Agricultural: agronomy; animal sciences; food science and technology; fish and wildlife; forestry; horticulture; phytopathology; phytoproduction;

plant sciences; soils and soil science; general agriculture; other agriculture, n.e.c.

Medical: dentistry; internal medicine; neurology; obstetrics and gynecology; ophthalmology; otolaryngology; pathology; pediatrics; pharmacology; pharmacy; preventive medicine; psychiatry; radiology; surgery; veterinary medicine; other medical, n.e.c.

Life sciences, n.e.c.

- b. **Psychology** deals with behavior, mental processes, and individual and group characteristics and abilities. Psychology in this survey is divided into three categories: biological aspects; social aspects; and psychological sciences, n.e.c. Examples of the disciplines under each of these fields are as follows:

Biological aspects: animal behavior; clinical psychology; comparative psychology; ethology; experimental psychology

Social aspects: development and personality; educational, personnel, and vocational psychology and testing; industrial and engineering psychology; social psychology

Psychological sciences, n.e.c.

- c. **Physical sciences** are concerned with understanding of the material universe and its phenomena. They comprise the fields of astronomy; chemistry; physics; and physical sciences, n.e.c. Examples of disciplines under each of these fields are as follows:

Astronomy: laboratory astrophysics; optical astronomy; radio astronomy; theoretical astrophysics; X-ray, gamma-ray, and neutrino astronomy

Chemistry: inorganic; organic; organometallic; physical

Physics: acoustics; atomic and molecular; condensed matter; elementary particle; nuclear structure; optics; plasma

Physical sciences, n.e.c.

- d. **Environmental sciences** (terrestrial and extraterrestrial) are, with one exception, concerned with the gross nonbiological properties of the areas of the solar system that directly or indirectly affect human survival and welfare. The one exception is that obligations for studies pertaining to life in the sea or other bodies of water are reported as support of oceanography and not biology. Environmental sciences comprise the fields of atmospheric sciences; geological sciences; oceanography; and environmental sciences, n.e.c. Examples of disciplines under each of these fields are as follows:

Atmospheric sciences: aeronomy; extraterrestrial atmospheres; meteorology; solar; weather modification

Geological sciences: engineering geophysics; general geology; geodesy and gravity; geomagnetism; hydrology; inorganic geochemistry; isotopic geochemistry; laboratory geophysics; organic geochemistry; paleomagnetism; paleontology; physical geography and cartography; seismology; soil sciences

Oceanography: biological oceanography; chemical oceanography; marine geophysics; physical oceanography

Environmental sciences, n.e.c.

- e. **Mathematics and computer sciences** employ logical reasoning with the aid of symbols and are concerned with the development of methods of operation employing such symbols and, in the case of computer sciences, with the application of such methods to automated information systems. Examples of disciplines under these fields are as follows:

Mathematics: algebra; analysis; applied mathematics; foundations and logic; geometry; numerical analysis; statistics; topology

Computer sciences: computer and information sciences (general); design, development, and application of computer capabilities to data storage and manipulation; information sciences and systems; programming languages; systems analysis

Mathematics and computer sciences, n.e.c.

- f. **Engineering** is concerned with studies directed toward developing engineering principles or toward making specific principles usable in engineering practice. Engineering in this survey is divided into eight fields: aeronautical; astronautical; chemical; civil; electrical; mechanical; metallurgy and materials; and engineering, n.e.c. Examples of disciplines under each of these fields are as follows:

Aeronautical: aerodynamics

Astronautical: aerospace; space technology

Chemical: petroleum; petroleum refining; process

Civil: architectural; hydraulic; hydrologic; marine; sanitary and environmental; structural; transportation

Electrical: communication; electronic; power

Mechanical: engineering mechanics

Metallurgy and materials: ceramic; mining; textile; welding

Engineering, n.e.c.: agricultural; bioengineering; biomedical; industrial and management; nuclear; ocean; systems

- g. **Social sciences** are directed toward an understanding of the behavior of social institutions and groups and of individuals as members of a group. Social sciences include anthropology; economics; political science; sociology; and social sciences, n.e.c. Examples of disciplines under the fields of social science are as follows:

Anthropology: applied anthropology; archaeology; cultural and personality; social and ethnology

Economics: economic systems and development; econometrics and economic statistics; history of economic thought; industrial, labor, and agricultural economics; international economics; macroeconomics; microeconomics; public finance and fiscal policy; theory

Political science: area or regional studies; comparative government; history of political ideas; international relations and law; national political and legal systems; political theory; public administration

Sociology: comparative and historical; complex organizations; culture and social structure; demography; group interactions; social problems and social welfare; sociological theory

Social sciences, n.e.c.: linguistics; research in education; research in history; research in law (e.g., attempts to assess impact on society of legal systems and practices); socioeconomic geography

- h. **Other sciences, n.e.c.:** This category is used for multidisciplinary or interdisciplinary projects that cannot be classified within one of the broad fields of science already listed.

6. A **performer** is either an intramural group or organization carrying out an operational function or an extramural organization or

person receiving support or providing services under a contract or grant.

- a. **Intramural performers** are the agencies of the Federal Government. Their work is carried on directly by agency personnel. Obligations reported under this category are for activities performed or to be performed by the reporting agency itself or represent funds that the agency transfers to another Federal agency for performance of work **as long as the ultimate performer is that agency or any Federal agency**. If the ultimate performer is not a Federal agency, the funds so transferred are reported by the transferring agency under the appropriate extramural performer category (universities and colleges, other nonprofit institutions, or industrial firms).

NOTE: Intramural activities cover not only the actual intramural R&D performance, but also the costs associated with the planning and administration of both intramural and extramural programs by Federal personnel. Intramural activities also include the costs of supplies and equipment, essentially of an “off-the-shelf” nature, that are procured for use in intramural R&D. For example, the purchase from an extramural source of an operational launch vehicle (i.e., one that has gone beyond the development or prototype stage) that is used for intramural performance of R&D is reported as a part of the cost of intramural R&D.

- b. **Extramural performers** are organizations outside the Federal sector that perform R&D with Federal funds under contract, grant, or cooperative agreement. Only those costs associated with actual R&D performance are reported, but these costs would include costs of materials and supplies to carry out R&D activities. Note, however, that the costs of off-the-shelf supplies and equipment required to support intramural R&D and procured from extramural suppliers are considered as part of the costs of intramural performance and not as part of the costs of extramural performance.

Extramural performers are identified as follows:

- i. **Industrial firms:** Organizations that may legally distribute net earnings to individuals or to other organizations.
- ii. **Universities and colleges:** Institutions engaged primarily in providing resident and/or accredited instruction for at least a one-year program above the secondary school level. Included are colleges of liberal arts; schools of arts and sciences; professional schools, as in engineering and medicine, including affiliated hospitals and associated research institutes; and agricultural experiment stations.
- iii. **Other nonprofit institutions:** Private organizations other than educational institutions whose net earnings in no part inure to the benefit of a private stockholder or individual and other private organizations organized for the exclusive purpose of turning over their entire net earnings to such nonprofit organizations.
- iv. **Federally funded research and development centers (FFRDCs):** R&D-performing organizations that are exclusively or substantially financed by the Federal Government and are supported by the Federal Government either to meet a particular R&D objective or, in some instances, to provide major facilities at universities for research and associated training purposes. Each center is administered either by an industrial firm, a university, or another nonprofit institution.

In general, all of the following criteria are met by an organization that is included in the FFRDC category:

- (1) Its primary activities include one or more of the following: basic research, applied research, development, or management of research and development (specifically excluded are organizations engaged primarily in routine quality control and testing, routine service activities, production, mapping and surveys, and information dissemination);
- (2) It is a separate operational unit within the parent organization or is organized as a separately incorporated organization;
- (3) It performs actual research and development or R&D management either upon direct request by the Federal Government or under a broad charter from the Federal Government but in either case under the direct monitorship of the Federal Government;
- (4) It receives its major financial support (70 percent or more) from the Federal Government, usually from one agency;
- (5) It has, or is expected to have, a long-term relationship with its sponsoring agency (about 5 years or more), as evidenced by specific obligations assumed by it and the agency;
- (6) Most or all of its facilities are owned by, or are funded under contract with, the Federal Government; and
- (7) It has an average annual budget (operating and capital equipment) of at least \$500,000.

- v. **State and local governments:** State and local government agencies, excluding State or local universities and colleges, agricultural experiment stations, medical schools, and affiliated hospitals. (Federal R&D funds obligated directly to such State and local institutions excluded in this category are included under the “Universities and colleges” category in this report.) R&D activities under the State and local category are performed either by the State or local agencies themselves or by other organizations under grants or contracts from such agencies. Regardless of the ultimate performer, Federal R&D funds directed to State and local governments are reported under this sector and no other.
- vi. **Foreign performers:** Foreign citizens, foreign organizations, or foreign governments, as well as international organizations (such as the North Atlantic Treaty Organization (NATO), United Nations Educational, Scientific, and Cultural Organization (UNESCO), and World Health Organization (WHO)), performing R&D work abroad financed by the Federal Government. Excluded are U.S. agencies, organizations, or citizens performing R&D abroad for the Federal Government; the survey does not seek information on “offshore” payments. An exception is made in the case of U.S. citizens performing R&D abroad under special foreign currency funds; these activities are included under “Foreign performers.” Foreign scientists performing in the United States are excluded, however.
- vii. **Private individuals:** For cases wherein an R&D grant or contract is awarded directly to a private

individual, obligations incurred are placed under “Industrial firms.”

- 7. **Federal obligations for research performed at universities and colleges, by detailed field of science:** Only six agencies participate in the portion of the survey covering the funding of research at universities and colleges by detailed field of science. These six agencies represent approximately 96 percent of the Federal research obligations to universities and colleges. The six agencies are the Departments of Agriculture, Defense, Energy, and Health and Human Services; the National Aeronautics and Space Administration (NASA); and the National Science Foundation (NSF).
- 8. **Geographic distribution of 1995 R&D obligations**
 - a. Only the 10 largest R&D funding agencies participate in the portion of the survey covering the geographic distribution of obligations for research and development and R&D plant. These 10 agencies accounted for approximately 98 percent of total Federal R&D and R&D plant obligations in 1995. The respondents are the Departments of Agriculture, Commerce, Energy, Defense, Health and Human Services, the Interior, and Transportation; the Environmental Protection Agency; NASA; and NSF.
 - b. Actual fiscal year 1995 data were requested in terms of the principal location (State or outlying area) where the work was performed by the primary contractor, grantee, or intramural organization. When this information was not available in their records, the respondents were asked to assign the obligations to the state, outlying area, or office abroad where the headquarters of the U.S. primary contractor, grantee, or intramural organization was located.
 - c. Obligations were reported for R&D as a combined amount.
 - d. Specifically omitted from the geographic portion of the survey were R&D obligations to foreign performers and support of

foreign performers. Foreign performer data, by country, are reported in a separate section of the Federal funds survey.

CHANGES IN REPORTING

While completing the survey forms each year, agency respondents make revisions to their estimates for the latest 2 years of the previous report, in this case fiscal years 1995 and 1996. Such revision is part of the budgetary cycle. From time to time survey submissions also reflect reappraisals and revisions in classification of various aspects of agencies' R&D programs. When such revisions occur, NSF requires the agencies to provide revised prior-year data to maintain consistency and comparability with the most recent concepts.

LIMITATIONS OF THE DATA

Funds for research and development were reported on a three-year basis comparable with the 1997 budget, upon which the data were based. The amounts reported for each year, as already stated, are the obligations or outlays incurred in that year, regardless of when funds were authorized or received by an agency and regardless of whether the funds were identified in the agency's budget specifically for research, development, R&D plant, or some combination of the three.

The respondents reconciled the data reported to the Federal funds survey with the amounts for R&D they reported to the Office of Management and Budget for the 1997 budget.

Some agencies are not able to report the full costs of research and development. For example, the headquarters costs of planning and administering R&D programs of the Department of Defense (DoD) (estimated at a fraction of 1 percent of the agency's R&D total) are excluded, because this agency has stated that identification of the amounts is impracticable.

R&D plant data are also underreported to some extent because of the difficulty encountered by some agencies, particularly DoD and NASA, in identifying and reporting these data. DoD's respondents report obligations for the R&D plant funded under the agency's construction appropriation, but they are able to identify only a small portion of the R&D plant support that is within R&D contracts funded from DoD's appropriation for research, development, testing, and evaluation. Similarly, NASA respondents cannot separately identify the portions of industrial R&D contracts that apply to R&D plant; R&D plant data are subsumed in the R&D data covering industrial performance. NASA R&D plant data for other performing sectors are reported separately.

SECTION B.

FEDERALLY FUNDED RESEARCH AND DEVELOPMENT CENTERS, BY AGENCY AND TYPE OF ADMINISTRATION

The following is the master list of federally funded research and development centers (FFRDCs) included in the Federal funds survey for fiscal years 1995–97. The list is arranged by sponsoring agency and adminis-

tering organization. Respondents reported under the FFRDC category those funds obligated to centers identified on this list.

Federally funded R&D centers, by agency and type of administration			
Sponsoring agency	Administered by universities and colleges ¹	Administered by other nonprofit institutions ²	Administered by industrial firms
DEPARTMENT OF DEFENSE: Office of the Secretary of Defense		Institute for Defense Analyses Studies and Analyses FFRDC (Institute for Defense Analyses), Alexandria, VA Logistics Management Institute (Logistics Management Institute), McLean, VA ³ National Defense Research Institute (RAND Corp. ⁴), Santa Monica, CA C3I Federally Funded Research and Development Center (MITRE Corp. ⁵), Bedford, MA, and McLean, VA	
Defense Advanced Research Projects Agency	Software Engineering Institute (Carnegie Mellon University), Pittsburgh, PA		
National Security Agency		Institute for Defense Analyses Communications and Computing Federally Funded Research and Development Center ⁷ (Institute for Defense Analyses), Alexandria, VA	
Department of the Navy		Center for Naval Analyses (The CNA Corp.), Alexandria, VA	
Department of the Air Force	Lincoln Laboratory (Massachusetts Institute of Technology), Lexington, MA	Aerospace Federally Funded Research and Development Center (The Aerospace Corp.), El Segundo, CA Project Air Force (RAND Corp. ⁴), Santa Monica, CA	
Department of the Army ⁶		Arroyo Center (RAND Corp. ⁴), Santa Monica, CA	
DEPARTMENT OF ENERGY ⁸	Ames Laboratory (Iowa State University of Science and Technology), Ames, IA Argonne National Laboratory (University of Chicago), Argonne, IL Brookhaven National Laboratory (Associated Universities, Inc.), Upton, Long Island, NY	National Renewable Energy Laboratory ⁹ (Midwest Research Institute), Golden, CO Pacific Northwest National Laboratory (Battelle Memorial Institute), Richland, WA	Idaho National Engineering Laboratory (Lockheed Martin Idaho Technologies Company), Idaho Falls, ID Oak Ridge National Laboratory (Lockheed Martin Energy Research Corp.), Oak Ridge, TN Sandia National Laboratories (Sandia Corp., a subsidiary of Lockheed Martin Corp.), Albuquerque, NM

See explanatory information, if any, and SOURCE at end of table.

Federally funded research and development centers, by agency and type of administration—Continued

Sponsoring agency	Administered by universities and colleges¹	Administered by other nonprofit institutions²	Administered by industrial firms
DEPARTMENT OF ENERGY ⁸ continued	<p>Ernest Orlando Lawrence Berkeley National Laboratory (University of California), Berkeley, CA</p> <p>Fermi National Accelerator Laboratory (Universities Research Association, Inc.), Batavia, IL</p> <p>Lawrence Livermore National Laboratory (University of California), Livermore, CA</p> <p>Los Alamos National Laboratory (University of California), Los Alamos, NM</p> <p>Oak Ridge Institute for Science and Education (Oak Ridge Associated Universities, Inc.), Oak Ridge, TN</p> <p>Princeton Plasma Physics Laboratory (Princeton University), Princeton, NJ</p> <p>Stanford Linear Accelerator Center (Leland Stanford Junior University), Stanford, CA</p> <p>Thomas Jefferson National Accelerator Facility (Southeastern Universities Research Association, Inc.), Newport News, VA¹⁰</p>		Savannah River Technology Center (Westinghouse Savannah River Co.), Aiken, SC
DEPARTMENT OF HEALTH AND HUMAN SERVICES: National Institutes of Health			NCI Frederick Cancer Research and Development Center (Science Applications International Corp.; Advanced BioScience Laboratories, Inc.; Charles River Laboratories, Inc.; Data Management Services, Inc.), Frederick, MD
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	Jet Propulsion Laboratory (California Institute of Technology), Pasadena, CA		

See explanatory information, if any, and SOURCE at end of table.

Federally funded research and development centers, by agency and type of administration—Continued

Sponsoring agency	Administered by universities and colleges ¹	Administered by other nonprofit institutions ²	Administered by industrial firms
NATIONAL SCIENCE FOUNDATION	<p>National Astronomy and Ionosphere Center (Cornell University), Arecibo, PR</p> <p>National Center for Atmospheric Research (University Corp. for Atmospheric Research), Boulder, CO</p> <p>National Optical Astronomy Observatories¹¹ (Association of Universities for Research in Astronomy, Inc.), Tucson, AZ</p> <p>National Radio Astronomy Observatory (Associated Universities, Inc.), Green Bank, WV</p>	Critical Technologies Institute (RAND Corp. ⁴), Washington, DC	
NUCLEAR REGULATORY COMMISSION		Center for Nuclear Waste Regulatory Analyses (Southwest Research Institute), San Antonio, TX	
DEPARTMENT OF TRANSPORTATION: Federal Aviation Administration		Center for Advanced Aviation System Development (MITRE Corp. ⁵), McLean, VA	
DEPARTMENT OF THE TREASURY: Internal Revenue Service		Tax Systems Modernization Institute (IIT Research Institute), Lanham, MD	

¹ Includes university consortia.

² That is, other than universities and colleges.

³ Logistics Management Institute moved from Bethesda, MD, to McLean, VA, in May 1994.

⁴ The following portions of the RAND Corp. are FFRDCs: National Defense Research Institute (formerly Defense/Office of the Joint Chiefs of Staff), Project Air Force, the Arroyo Center, and the Critical Technologies Institute. All other agency support to RAND is reported under "other nonprofit institutions excluding FFRDCs."

⁵ Only the C3I Federally Funded Research and Development Center and the Center for Advanced Aviation System Development parts of the MITRE Corp. are FFRDCs. All other agency support to MITRE is reported under "other nonprofit institutions excluding FFRDCs."

⁶ The Department of the Army decertified the Institute for Advanced Technology (University of Texas), Austin, TX, as an FFRDC in November 1993.

⁷ Although the Institute for Defense Analyses Communications and Computing FFRDC has been in existence since 1956, the Department of Defense added it to the Master Government List of FFRDCs for the first time in October 1995.

⁸ The Department of Energy decertified Bettis Atomic Power Laboratory, Hanford Engineering Development Laboratory, and Knolls Atomic Power Laboratory as FFRDCs in October/November 1992. The Department of Energy removed from the Master Government List of FFRDCs (1) the Energy Technology Engineering Center in November 1995 and (2) the Inhalation Toxicology Research Institute in May 1996.

⁹ In September 1991 the name was changed from Solar Energy Research Institute.

¹⁰ In May 1996 the name was changed from Continuous Electron Beam Accelerator Facility.

¹¹ Since February 1984 this center has included three former FFRDCs: Cerro Tololo Inter-American Observatory, Kitt Peak National Observatory, and the National Solar Observatory (formerly Sacramento Peak Observatory).

SOURCE: National Science Foundation/SRS

Updates of this list and an Annotated List of FFRDCs are available at <http://www.nsf.gov/sbe/srs/ffrdc96/start.htm>.